

## What can organic agriculture contribute to sustainable development? – Long-term comparisons of farming systems in the tropics

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### Abstract

*Despite the high demand for sound data on the agronomic, ecological and economic performance of organic agriculture in developing countries, systematic comparison of organic and conventional farming systems has not so far been carried out. The Research Institute of Organic Farming (FiBL), together with its partners, is presently establishing long-term comparisons of farming systems in various agro-ecological and agro-economic contexts to study the different parameters that are essential for sustainable development. To date, three study areas have been selected: (a) a sub-humid area in Kenya where farming is subsistence-oriented; (b) a semi-arid area in India where cotton is produced for the export market; and (c) a humid area in Bolivia where perennial fruits and cacao are produced for the domestic and export markets. The key elements in these comparisons are replicated long-term field trials. These are complemented by farm surveys and short-term trials under on-farm conditions. This network of comparison of farming systems in the tropics is expected to (1) put the discussion on the benefits and drawbacks of organic agriculture on a rational footing; (2) help to identify challenges for organic agriculture that can then be addressed systematically; (3) provide physical reference points for stakeholders in agricultural research and development and thus support agricultural policy dialogue at different levels.*

### Introduction

In Europe and North America, considerable research has been carried out on organic farming and its impact. The advantages of the organic system in terms of both ecosystem conservation and economic performance have been demonstrated by numerous studies (Pimentel et al. 2005, Offermann and Nieberg 2000, Stolze et al. 2000). An important contribution in this regard has been made by the DOK trial (DOK = (bio)dynamic, organic, conventional), conducted in Therwil, Switzerland, and now in its 28th year (Mäder et al. 2002). Organic farming is now also being promoted by non-governmental organizations (NGOs) in tropical countries, and farmers' groups are adopting organic methods of cultivation to improve their food security and their income (Kilcher 2007). So far, however, there have been no systematic studies examining the efficiency of organic farming methods in the tropics compared to conventional approaches with regard to achieving economic, social and environmental objectives (Parrott and Kalibwani 2006). Whether and how organic farming can contribute to development in low-income tropical countries is of interest not only to producers'

organizations, but also to research institutes, development organizations, national authorities and international donors.

The Research Institute of Organic Agriculture (Forschungsinstitut für biologischen Landbau – FiBL), together with its partners, has set itself the task of establishing a network of long-term comparisons of farming systems to investigate the contribution of organic farming to enhancing food security, combating poverty and conserving tropical ecosystems.

### **Research questions**

In the long-term comparisons of farming systems run by FiBL, organic farming is compared to conventional production with a view to addressing the following questions:

- How does organic farming influence yield and yield security, especially in years with extreme climatic conditions such as droughts or floods? What impact does it have on product quality and shelf-life?
- How does organic farming influence agro-ecosystem stability and availability and quality of natural resources, especially soil fertility, energy resources, biodiversity and beneficial organisms?
- Do organic products create value-added that generates higher incomes?
- How does organic farming affect the living standard of the farmers?
- How efficient is the organic farming system with regard to nutrient and energy use, and in terms of capital and labour requirement?

### **Methodology**

Central to FiBL's comparison of farming systems in Africa, Asia and Latin America are replicated field trials reflecting the crop rotations and cultivation methods currently practised in the given locality (see also below). These trials are geared towards addressing agro-economic and environmental research questions over a longer period and investigating processes of change. Straightforward analysis of economic feasibility (gross margin) can also be carried out. In a second step, the same parameters are also compared in on-farm trials in conditions that reflect actual practice, but in a shorter time-frame. As part of this, the experiment is repeated for all farming techniques on every holding involved. To complete the picture, farm-level comparison of socio-economic aspects such as income structure and living standard is also carried out (Eyhorn et al. 2007). In regions where there are numerous organic holdings, farms are selected for study on the basis of random sampling. In locations where organic farming is not widespread, pairs of organic and conventional holdings operating under comparable conditions are selected for study. Case studies are also carried out to illustrate the process of conversion and its impact on the environmental, economic and social situation over a longer period (Lee and Fowler 2002). The data base obtained from the field and on-farm trials and surveys is subsequently made available for organic sector development in the region in question, and especially for agricultural training and extension, for market development and policy consultation.

### **Locations**

FiBL and its partners are developing sites for long-term comparison of farming systems in three countries:

In Kenya, investigation centres on largely subsistence-oriented cultivation of maize and vegetables in sub-humid conditions. The farming methods – conventional and organic, at two levels of intensity in each case – were applied for the first time in March 2007. Local partners are the Institute of Insect Physiology and Ecology (ICIPE), the Tropical Soil Biology and Fertility Institute (TSBF-CIAT), the Kenyan Agricultural Research Institute (KARI) and the School of Environmental Studies and Human Sciences of Kenyatta University (KU).

In India, a comparison of farming systems based on cultivation of an export product – cotton – is being set up in a semi-arid region. Soya and wheat, another two important agricultural products in this region, are also included in the investigations. The trial consists of one organic, one biodynamic, one conventional and one GMO system, and operations commenced in the 2007 cotton season. The main local partner is a cotton trading company (bioRe India). Appraisal of research partners is currently under way.

A third site is currently under development in a humid region of Bolivia. In this case, the crop that the trial will focus on is a long-standing export product, cacao, cultivated in agroforestry systems. Planting of the trial site will be carried out in April 2008. The following institutions have joined forces to form a network of partners: Promoción e investigación de productos andinos (PROINPA), Instituto de Ecología de la Universidad La Paz, Asociación de organizaciones de productores ecológicos de Bolivia (AOPEB), El Ceibo.

### Strategic objectives

FiBL is developing this network for long-term comparison of farming systems because:

- the debate on organic farming in southern countries needs to be put on an rational basis;
- it will provide governments and donors in southern countries with support for making strategic decisions and developing action plans;
- it will help to identify challenges for organic farming in southern countries and address them systematically;
- it will provide decisive results-based support for developing organic farming in the region in question, as demonstrated by the experience of the DOK trials in Switzerland in the 1970s and 80s.

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